Golder Associates

February 17, 2004

033-7365

Norcal Waste Systems Hay Road Landfill, Inc.
6426 Hay Road
Vacaville, California 95687

ATTN: Mr. Greg Pryor

RE: DM-5.2 BASE LINER DESIGN REPORT AND CONSTRUCTION DOCUMENTS NORCAL WASTE SYSTEMS HAY ROAD LANDFILL SOLANO COUNTY, CALIFORNIA

Dear Mr. Pryor:

Golder Associates Inc. (Golder) is pleased to submit this design report and attached construction documents for the construction of the Disposal Module (DM) 5.2 base liner system at the Norcal Waste Systems Hay Road Sanitary Landfill (NWSHRL) in Solano County, California. Norcal Waste Systems Hay Road Landfill, Inc. (NWSHRLI) owns and operates the NWSHRL as a Class II solid waste disposal facility.

This report presents the grading plan and base liner design for DM-5.2, which has been designed as a Class II disposal unit in compliance with the design requirements specified in the site's Waste Discharge Requirements (WDR's) Order No. R5-2003-0118 dated (July 18, 2003). Construction of DM-5.2 is planned to begin in April 2004 with the placement of general fill. Drawing 1 of the Construction Plans (Appendix A) shows the site vicinity and location maps. Drawing 2 shows the site development plan and the limits of the DM-5.2 base liner.

FINAL BASE GRADING

The grading plan for DM-5.2 conforms to the minimum ground water separation requirements developed by Geosyntec (1995) and stipulated in WDR's Order No. R5-2003-0118. Grading for DM-5.2 will involve minor excavation in the sump area and placement of approximately 65,000 cubic yards of general fill to establish the lower limits of the liner system as shown in Drawing 3 of the construction plans (Appendix A). The final base grades maintain a minimum 2 percent grade on the floor and 1 percent grade along the Leachate Collection and Removal System (LCRS) drainage pipes, which are consistent with the construction of previous Class II landfill disposal units at the site (DM-2.2a, DM-2.2b, DM-11.1, DM-11.2, DM-5.1, and DM-4.1). The base grading and construction requirements are designed to provide positive drainage to the collection sump and to provide a firm, stable foundation for the containment system (Geosyntec, 1995).

The interior slopes of the perimeter levee will be graded to 2H:1V (horizontal to vertical) with a crest elevation of 40 feet mean sea level (msl). The minimum elevation of the containment system is based on the maximum anticipated groundwater elevation. This maximum elevation is

interpolated to be 20.8 feet msl at the sump location based on the historical groundwater elevations presented in Geosyntec (1995).

CONTAINMENT SYSTEM CONFIGURATION

The DM-5.2 containment system conforms to the containment system described in Golder's Liner Performance Demonstration Report (April 15, 2003) and the associated May 6, 2003 addendum. This containment system configuration was adopted as Finding 53 in the WDR's Order No. R5-2003-0118. As described in these documents, the containment system for the 2H:1V side-slope consists of the following components from top to bottom:

- 18-inch thick operations layer;
- LCRS geocomposite drainage layer;
- 60-mil single-sided textured HDPE geomembrane (texture facing down);
- Geosynthetic clay liner (Gundseal with 30-mil HDPE geomembrane backing or equivalent – geomembrane backing on bottom); and
- Subgrade (compacted general fill).

The proposed floor liner system consists of the following components from top to bottom:

- 12-inch thick operations layer;
- 8-oz/sy geotextile filter layer;
- 6-inch thick LCRS gravel (3/8-inch minus);
- 60-mil textured HDPE geomembrane;
- 24-inch thick low-permeability soil ($k \leq 1x10^{-7}$ cm/s);
- 6-inch thick foundation soil ;
- Leak detection geocomposite drainage layer;
- 60-mil textured HDPE geomembrane; and
- Subgrade (fine-grained soils).

The DM-5.2 base liner project includes the following additional design and/or enhanced CQA features:

- An electrical leak location survey to be conducted following the placement of the operations soil layer in accordance with the current WDR's.

- The construction specifications require that LCRS gravel grading equipment contain laser or global positioning surveying equipment that provides the operator with real-time measurements of the dozer blade relative to the liner.

- Additional perforated pipes have been included in the LCRS gravel layer offset 130 feet horizontally from the central LCRS pipe (Appendix A, Drawing 3). These pipes are available to extract landfill gas from the LCRS layer if future engineering evaluations determine that this is necessary to provide adequate landfill gas control.

- A 2-inch diameter injection pipe has been included to allow annual testing of the LCRS by injection a known quantity and rate of water and evaluating the response at the LCRS sump.

As concluded in the Liner Performance Demonstration Report (Golder, April 15, 2003), the containment system for DM-4.1 (and DM-5.2) meets or exceeds the state standards as outlined in Title 27 of the California Code of Regulations, the federal standards provided in Subtitle D.

FILL PLAN

Figure 1 presents an interim waste fill plan for DM-5.2. The slopes are designed to be consistent with the final grading plan presented in the Preliminary Closure/Postclosure Maintenance Plan (Golder, 2002). Final slopes are inclined at 4H:1V (east), while temporary (interim) refuse slopes are inclined at 3H:1V (north, south and west).

Slope stability analyses were completed to verify the stability of the proposed interim fill slopes for DM-5.2 (Appendix B). The stability analyses were completed using a two-dimensional, limit-equilibrium method of slices with the aid of the slope stability program SLIDE (v. 3.046).

The critical slope configuration for DM-5.2 was identified as the interim fill slope represented by Section A-A'. Stability analyses were performed for the slopes identified by section lines A-A' and B-B' as shown in Figure B-1. These sections are shown in Figure B-2. The potential failure planes for each section extend along the base liner system then progress upward through the refuse, as shown by the graphical stability outputs in Appendix B. Strength parameters used in the analyses include the following:

- The shear strength of the refuse was assumed to correspond to a linear failure envelope represented by an internal angle of friction of 30 degrees and a cohesion of 200 psf. These strength values are within the range of refuse strength parameters recommended by Singh and Murphy (1990).

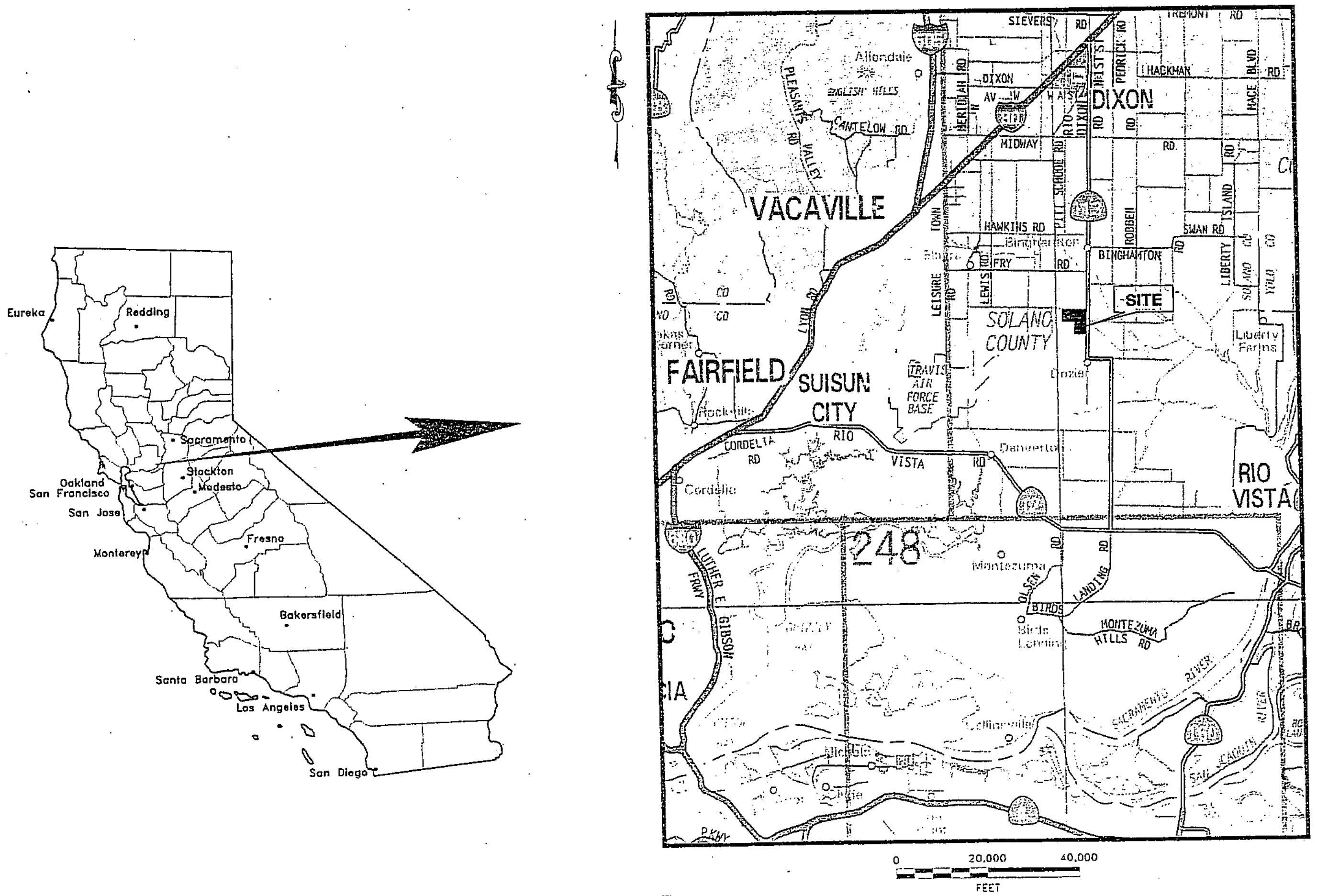
- The critical interface on the base liner is between the smooth geomembrane and the LCRS geocomposite drainage layer. The strength of this interface was assumed to correspond to an internal angle of friction of 12.5 degrees with no adhesion. The interface shear strength was characterized based on Golder's historical direct shear test data base. In addition, the Construction Documents include provisions to complete direct shear interface testing of the DM-5.2 liner materials to confirm our design assumptions prior to construction.

For seismic stability, the seismically induced permanent displacements were estimated using the site-specific deformation chart developed by Geosyntec (1995). The design chart is based on a

CONSTRUCTION DRAWINGS

NWS HAY ROAD LANDFILL BASE LINER SYSTEM DISPOSAL MODULE 5.2

SOLANO COUNTY, CALIFORNIA



LOCATION MAP

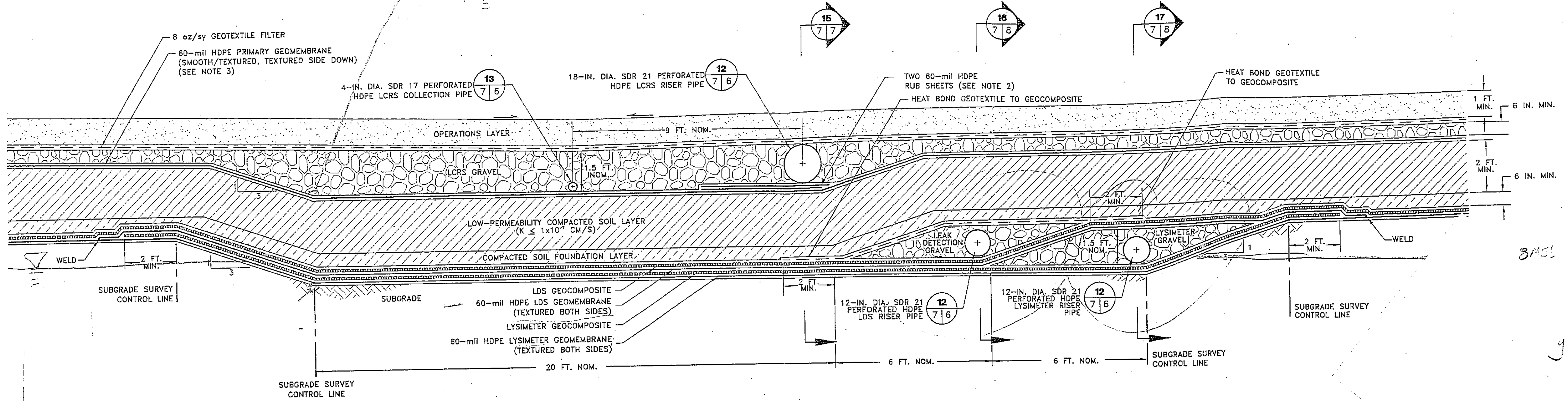
DRAWING NO.	TITLE
1	COVER SHEET
2	SITE PLAN
3	SUBGRADE PLAN
4	CROSS-SECTIONS
5	CONTAINMENT SYSTEM DETAILS
6	CONTAINMENT SYSTEM DETAILS
7	SUMP DETAILS
8	SUMP DETAILS
9	SOIL BORROW EXCAVATION PLAN
10	SUBGRADE SURVEY GRID PLAN

PREPARED BY:

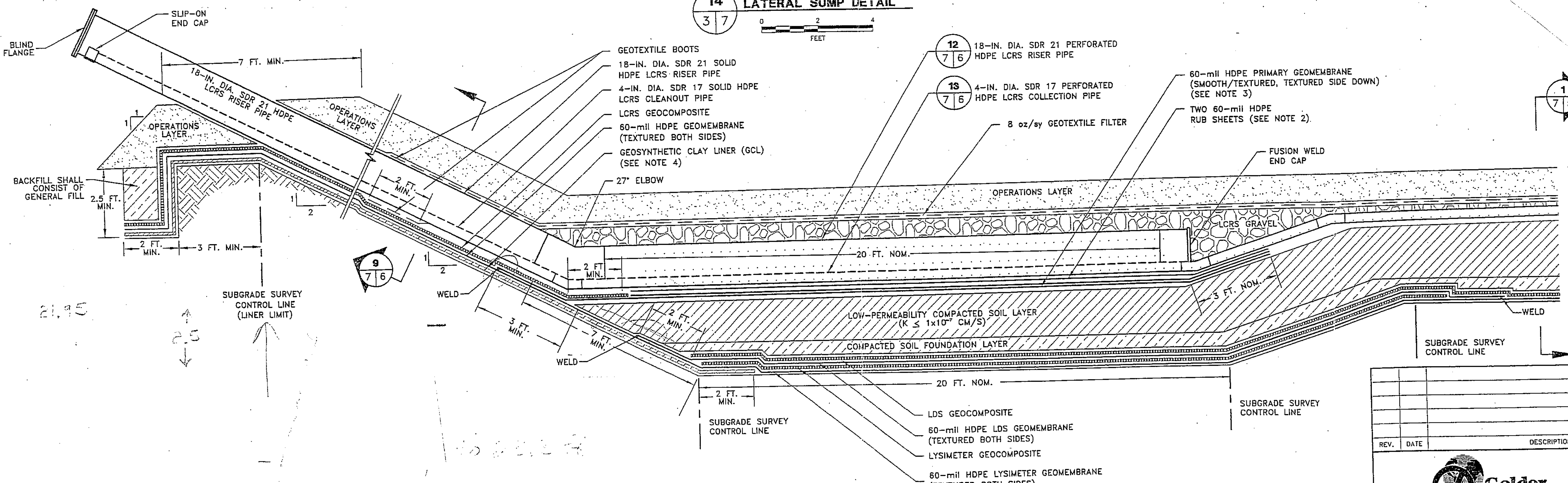
Golder Associates
Roseville, California

PROJECT NO.: 033-7365
PREPARED: FEBRUARY 2004

NOTES:
1) BASE MAP FROM THE THOMAS GUIDE, CALIFORNIA ROAD ATLAS AND DRIVER'S GUIDE, 2000.



14 LATERAL SUMP DETAIL (3/7)



15 SUMP DETAIL AT LCRS RISER PIPE (3/7, 7/7)

LEGEND:

2H:1V	SLOPE INDICATOR
1/2	SLOPE INDICATOR
2%	GRADE INDICATOR

A — DETAIL/SECTION DESIGNATION; 0 — DRAWING WHERE SECTION/DETAIL IS LOCATED; 2 — DRAWING WHERE SECTION/DETAIL IS REFERENCED

NOTES:

1) GEOSYNTHETICS THICKNESS EXAGGERATED FOR CLARITY.
2) TWO 5 FT WIDE 60-mil HDPE RUB SHEETS OR ONE 5 FT WIDE GEOCOMPOSITE RUB SHEET SHALL BE PLACED UNDER THE 18 IN. DIAMETER LCRS PIPE WHERE IT LAYS OVER THE FLOOR GEOMEMBRANE. OVERLAP RUB SHEETS WITH LCRS GEOCOMPOSITE
3) AS AN ALTERNATIVE TO SINGLE-SIDED TEXTURE, THE PRIMARY GEOMEMBRANE MAY BE TEXTURED ON BOTH SIDES.
4) GCL SHALL INCLUDE A 30-MIL HDPE GEOMEMBRANE BACKING. HDPE GEOMEMBRANE BACKING SHALL BE PLACED FACING DOWN.

REV.	DATE	DESCRIPTION	DRN BY	RVW BY

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DRN BY: ACP
RVW BY:

PROJECT NO.: 033-7365 TASK NO.: 1
PROJECT: NWS HAY ROAD LANDFILL DISPOSAL MODULE 5.2
SHEET TITLE: SUMP DETAILS

REGISTERED PROFESSIONAL ENGINEER — PETER E. BOWERS — NO. C45436 — CIVIL — STATE OF CALIFORNIA

NORCAL WASTE SYSTEMS
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6426 HAY ROAD
VACAVILLE, CALIFORNIA 95688
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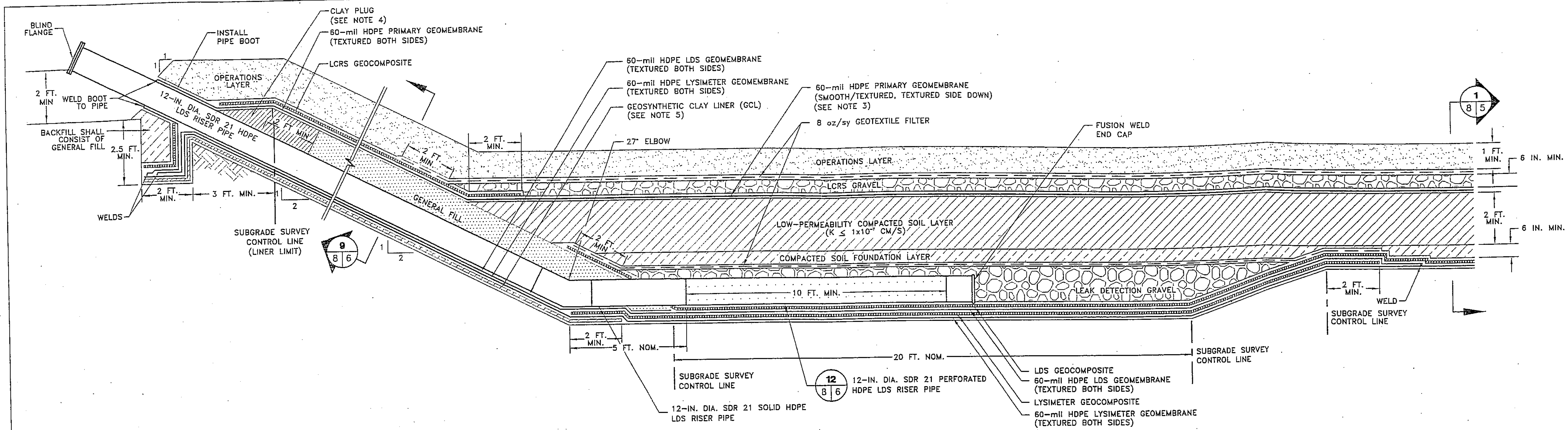
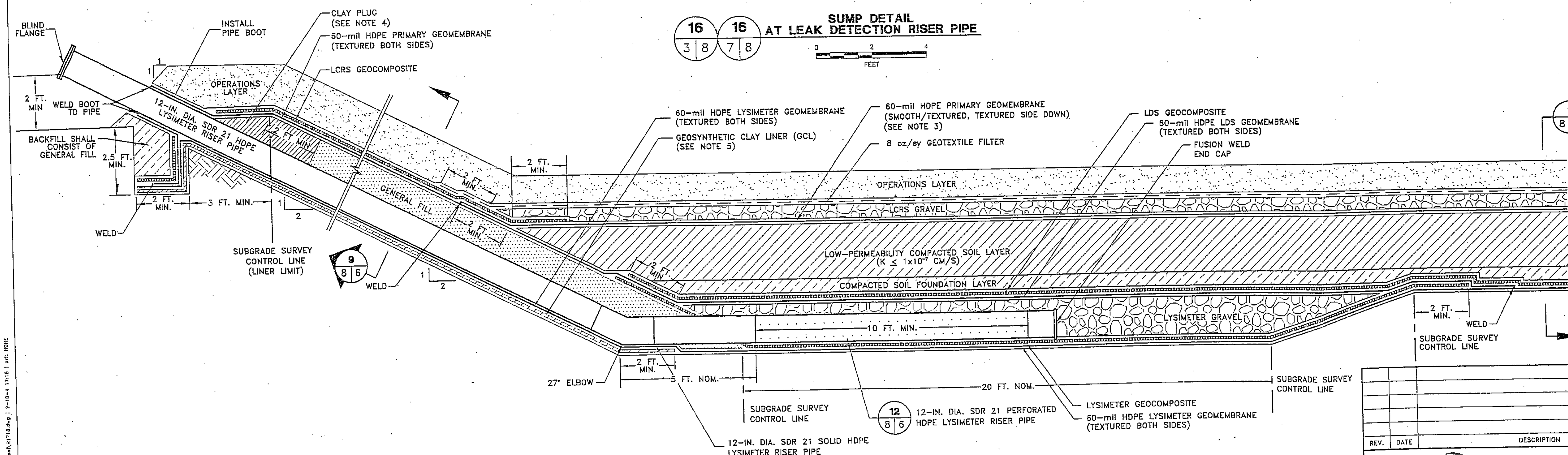
SHEET: 7 OF 10
DRAWING NO.: 7 REV.: 0



16 | 3 8 — 16 | 7 8 **SUMP DETAIL AT LEAK DETECTION RISER PIPE**

0 2 4 FEET



17 | 3 8 — 17 | 7 8 **SUMP DETAIL AT LYSIMETER RISER PIPE**

0 2 4 FEET

LEGEND:

- 2H:1V — SLOPE INDICATOR
- 1/2 — SLOPE INDICATOR
- 2% — GRADE INDICATOR
- A / 0 2 — DETAIL/SECTION DESIGNATION; DRAWING WHERE SECTION/DETAIL IS LOCATED; DRAWING WHERE SECTION/DETAIL IS REFERENCED

NOTES:

1) GEOSYNTHETICS THICKNESS EXAGGERATED FOR CLARITY.
2) TWO 5 FT WIDE 60-mil HDPE RUB SHEETS OR ONE 5 FT WIDE GEOCOMPOSITE RUB SHEET SHALL BE PLACED UNDER THE 18 IN. DIAMETER LCRS PIPE WHERE IT LAYS OVER THE FLOOR GEOMEMBRANE. EXTEND RUB SHEET 2-FEET UP SLOPE.
3) AS AN ALTERNATIVE TO SINGLE-SIDED TEXTURE, THE PRIMARY GEOMEMBRANE MAY BE TEXTURED ON BOTH SIDES.
4) CLAY PLUG SHALL CONSIST OF ONSITE CLAY. CLAY PLUG SHALL BE COMPACTED TO 90% MODIFIED PROCTOR (ASTM D1557) AT 0 TO +4% OF OPTIMUM MOISTURE CONTENT.
5) GCL SHALL INCLUDE A 30-MIL HDPE GEOMEMBRANE BACKING. HDPE GEOMEMBRANE BACKING SHALL BE PLACED FACING DOWN.

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PROJECT NO.: 033-7365 TASK NO.: 1

DES BY: [signature] DRN BY: ACP RVW BY: [signature]

PROJECT: NWS HAY ROAD LANDFILL DISPOSAL MODULE 5.2

SHEET TITLE: SUMP DETAILS

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SHEET: 8 OF 10

DRAWING NO.: 8 REV.: 0